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Two approaches, one problem: Cultural constructions of type II diabetes in an indigenous community in Yucatán, Mexico

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ABSTRACT

The emerging epidemic of obesity and type II diabetes in Mexico has recently propelled the nation into the public health spotlight. In the state of Yucatán, the experience of diabetes is greatly impacted by two cultural constructions of disease. In this setting, elements of Yucatec Mayan health practices as well as the biomedical model affect the approach to type II diabetes. Both frameworks offer unique understandings of the etiology of diabetes and recommend different ways to manage the condition. Based on in-depth and semi-structured interviews with both community members and clinicians, the present study seeks to understand how diabetes is understood and treated in indigenous settings in rural Yucatán. We explore the context in which community members navigate between locally available healthcare options, choose one over the other, or incorporate strategies from both into their diabetes care regimens. The tension between indigenous community members and their biomedical healthcare providers, the changing food environment of this community, and the persistence of traditional gender constructions affect the management of type II diabetes and its associated symptoms.

1. Introduction

Over the last three decades, the southeastern state of Yucatán, Mexico has witnessed a dramatic increase in the incidence and prevalence of type II diabetes. The less developed southern region of Mexico, which includes Yucatán, experienced a 128% increase in diabetes mortality rates from 1980 to 2000 compared to the more developed northern region, where mortality increased 32.5% (Barquera et al., 2013a). The emerging diabetes epidemic plays out against a backdrop of key cultural practices. Yucatán remains one of the most indigenous states in all of Mexico (INEGI, 2010). The 2010 population census reports that 62.7% of Yucatán residents age three or older identify as indigenous, the highest rate in the nation (INEGI, 2010). Spanish is the second language for many residents, and Maya is the first: 29.6% of all Yucatán residents age three or older speak an indigenous language (INEGI, 2010).

Historically, indigenous groups in Mexico have faced massive inequalities due to oppressive institutions and policies. While these policies are no longer in place, their effects are still pernicious in the disparities that exist between indigenous and non-indigenous groups (Patrinos, 2000). Rates of poverty among the indigenous, for example, are approximately 50% higher than rates of poverty in the general Mexican population (Garcia-Moreno and Patrinos, 2011). These inequalities extend to health, from higher rates of infant mortality to poorer access to healthcare to increased burden of disease, including type II diabetes (Patrinos, 2000). In a variety of settings, health vulnerabilities arise among populations when ethnicity and gender interact with social and economic inequalities such as those experienced by the Yucatec Maya (Page-Pliego, 2015; Farmer, 2001).

Additionally, the intersection and influence of several cultures affect the health behaviors in Yucatán. The Yucatec Mayan understanding of disease has evolved over centuries and incorporates elements from a wide range of cultural traditions (Page-Pliego, 2015). Indigenous understanding of physical health incorporates not only the body, but also harmony with nature, the emotional self, and other members of society (Hale-Gallardo, 2015). In addition to informing an understanding of disease etiology, this framework also influences healthcare treatments and decisions. The Maya have relied on plant-based remedies to manage their health problems for centuries, and many continue to do so today (Ortiz et al., 2007).

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The other dominant influence on healthcare behaviors in Yucatán stems from the culture of biomedicine. As seen in the more traditional approaches to medicine, biomedicine is influenced by a variety of historical, cultural, and political factors (Lock and Nguyen, 2010). Modern biomedicine is based on molecular biology and advancements in technology. Disease is often defined as deviations from the norm of measurable biological variables (Lock and Nguyen, 2010; Martin and Peterson, 2009). It tends to focus on patient experience solely as a progression of physiological symptoms (Higgs et al., 2008). Recently biomedicine has acknowledged the role of social determinants of health as well as emotional and psychosocial stress on chronic disease etiology and outcomes; some have begun to incorporate these factors into its model of disease (Higgs et al., 2008; Ely et al., 2011). However, the biomedical approach has a long and continuing tradition of physical health and illness only being shaped by biological processes and Western medical care (House, 2001).

Although there is literature exploring diabetes in Mayan populations, these studies tend to largely ignore the state of Yucatán. In a study on the influence of sugar-sweetened beverages (SSBs) on diabetes among the Maya of Chiapas, participants acknowledged the importance of these products in causing the condition (Page-Pliego, 2013). Additional research has explored the subjective understanding of six respondents in the state of Chiapas regarding the causes of their diabetes (Page-Pliego, 2015). Other studies of type II diabetes in Mayan populations of Mexico have focused on social support as a part of the care regimen (Juárez-Ramírez et al., 2015). Therefore, the current literature tends to separately emphasize one aspect of the diabetes experience – either causes or management strategies. Little work has been done on integrating both understanding of and care strategies for type II diabetes among the Yucatec Maya.

Based on semi-structured interviews with indigenous participants and biomedical doctors in rural Yucatan, we explore the etiological understandings of and management strategies for type II diabetes. We examine the diversity of factors that influence how diabetes is understood and managed in one rural, indigenous *puebla* in Yucatán.

2. Research methods and study site

Ethical clearance was provided by the Fulbright U.S. Program..

2.1. Study setting

We performed our study in the small, rural community of Tope (pseudonym) in the state of Yucatán. Located approximately 100 miles from the state capital of Mérida, the population of Tope is 5250 (INEGI, 2010). The community was selected for its size, rural location, and the prominent indigenous presence within the community, as well as for social networks established by the second author in previous research. Over 80% of the population of Tope reports speaking Yucatec Maya (INEGI, 2010). In addition to the widespread use of the Yucatec Mayan language, other indicators of the indigenous presence include the use of traditional *huipiles* among many women as their preferred manner of dress. Many men still make their living working in the *milpa* (parcel of land), following the Mayan custom of slash-and-burn agriculture. People sleep in hammocks in *palapa*-style housing, while tortillas and other foods are cooked over open flames in outdoor kitchens.

Previous research identified Tope as a new sending community of international migrants to the United States. The subsequent influx of remittances infused this indigenous community with previously unavailable goods and services. Of particular interest was the newly constructed biomedical health clinic, staffed by two physicians and one director. The clinic provided primary care and included a small pharmacy with medications available for diabetes treatment. Government health programs subsidized these medications as needed. A well-resourced clinic of this magnitude is exceptional in a Yucatec town the size of Tope. Several participants noted that Tope's international migrants in the United States had pooled resources to fund the construction of the clinic. A plaque outside the clinic acknowledged the role that international migrants played in the clinic's inception: “To our brothers in Portland, Oregon”.

2.2. Methodology

The research relied on qualitative techniques of semi-structured interviews and a snowball-sampling frame. A total of 36 interviews were conducted, 34 with community members as well as an additional two interviews with the clinicians employed in the health care facility. Due to the limited amount of respondents in any population with diabetes as well as to time constraints, scientific sampling was not an option. Additionally, due to sensitivity of the topics, we determined that snowball sampling and personal interviews were the most effective way to recruit respondents into our study. Snowball sampling allows researchers to more easily identify and build a sample of respondents with hidden or even stigmatized characteristics (Esterberg, 2002). Community participants were initially chosen in consultation with the key informant, a community leader greatly involved in indigenous preservation and economic empowerment. Our key informant provided introductions and ensured access to community members. Additionally, the participants themselves actively recommended other potential respondents, referring us to relatives and friends. The snowball sampling method produced 34 community participants (9 men and 25 women), who ranged in age from 33 to 88 years old and represented a variety of socioeconomic statuses and geographic areas of Tope. While we hoped to interview equal numbers of men and women, men often declined to answer questions about diabetes. All community participants identified as indigenous. Of the 34 participants, 24 had type II diabetes and 10 did not. Non-diabetic participants were included to enrich the understanding of the significance of type II diabetes in the community as a whole.

The principal investigator (PI) lived in the vicinity of Tope for nine months during the fall of 2014 through the spring of 2015. Interviews were conducted from September through March. Interview questions were posed in Spanish by the PI. Responses were given in Spanish and in Yucatec Maya. Again the key informant was central to the research process, as she translated between Spanish and Maya when necessary. The interviews ranged from 20 min to over two hours in duration, with an average of 35 min per interview. Due to high rates of illiteracy among the respondent population, verbal informed consent was obtained from each participant prior to the interview.

The interview guide for the community members explored participants' impressions of social, cultural, and dietary influences on diabetes. The interviews were designed to examine participants' perspectives regarding the etiology of type II diabetes, diabetes management strategies, and the food environment. The interviews also sought to identify barriers to effective diabetes management, such as access to healthcare, food choice and availability, and exercise. The probing questions allowed participants to elaborate about practices and influences related to diabetes that seemed most relevant to them. A separate interview guide for the two general practitioners employed by the clinic used a biomedical focus to probe their understanding of the state of diabetes within Tope. For example, the clinicians were asked to describe the

treatment regimens they prescribed, and how receptive their patients were to these recommendations. Additionally, the doctors, who were from large urban centers and lived in Tope only when working, were asked to elaborate on their understandings of the cultural environment within the community.

In order to avoid increasing the power dynamic between the participants and PI (Spradley, 2016), audio recording equipment was not used. Interview notes were hand-written in Spanish, translated to English post-interview, then coded for apparent themes. Our analysis approach was open coding, in which we worked closely with the data, reading each interview line by line, to identify key themes and categories. We allowed the themes to emerge from the analysis of the interviews. When we were able to see redundancy of themes in our ongoing content analysis, and due to time constraints, we decided that the sample size was sufficient. (Additionally, according to counts by the clinic director, we had interviewed approximately 25% of the local population with clinically-diagnosed diabetes.) This close content analysis revealed significant themes, which were subsequently grouped under the following headings: diabetes, clinic visits, natural or plant-based medicine, *susto*, sugar, dietary factors, and US migratory experience. The authors discussed the main themes and categories throughout the analysis process.

3. Results

3.1. Healthcare options and utilization

We asked participants to speak about locally available healthcare options. Two diabetes management strategies were accessible in Tope: plant-derived treatments used in the Mayan culture as well as biomedical therapies. A total of 21 participants cited specific plant-based remedies used to manage diabetes or its complications, such as skin infections, circulation problems, and vision loss. Some diabetic participants incorporated these plants, such as a tea made from zapote (*Pouteria zapote)* or kan-lor (*Tecoma stans)*, into their treatment regimens. Even many participants who did not use plant-based remedies identified the species believed to be effective in controlling diabetes. When asked how they knew which plants were appropriate to treat diabetes and how to prepare them, participants stated that they had learned these treatments either from relatives, specifically parents or grandparents, or from an esteemed member of the community renowned for his knowledge of medicinal plants.

Overwhelmingly, patients who used plant-based remedies did so in conjunction with the pharmaceuticals prescribed by the clinic. The natural remedies were taken as supplements. One participant elaborated: “I take the natural medicines when I feel that the pills aren't doing enough or are hurting my stomach. But I only take [natural medicines] sometimes. Every once in awhile”. This complemental approach was representative of the vast majority of participants that utilized natural medicines. Patients stated that, since the plants had been used for generations and were derived from natural sources, they were healthy and safe to take either alone or in conjunction with other treatments.

Only one respondent relied totally on plant-based treatments to manage her diabetes. She explained,

> I only take the natural medicines, and those work fine for me. It is because I believe that they will work. If you do not believe the natural medicine will work, then it will not work. You have to believe … and also follow a diet. The natural medicines will not work if you do not believe and if you do not follow a diet. This is why so many people prefer pills. They do not have the patience to wait or to follow a diet.

The conviction that “plant-based medicines only worked if you believed in them” was shared by all participants who used them.

In addition to the use of plant-based remedies, the community of Tope had access to the biomedical primary care clinic. The physician-director had been stationed at the clinic for six years, but typically came in only twice a week. The other attending physicians were medical students doing their required year of service to receive their medical degrees. As a result, the turnover of medical staff at the clinic was high and fairly rapid.

The biomedical facility tracked cases of clinically diagnosed type II diabetes in Tope. According to the clinic director, Tope had 125 recorded cases of diabetes, a number which left him convinced of major underreporting. He believed that the underreporting of diabetes was due to lack of regular biomedical consultations by residents of Tope. The clinic director hypothesized that a lack of education and ability to recognize the symptoms of the condition kept community members away from the clinic. The clinic director and other attending physician were aware of local medical practices, although they berated the use of plant-based medicines or other traditional therapies as ineffective and stuck in the past:

> I know some of them still use plants or natural medicines or whatever, but I don't really ask them about that. They'll do it if they want, so I don't really bother. I just tell them what will help them best from what I know. I don't know anything about the natural medicines or what they might be using. It's a practice left from the old traditions. But I don't think it really makes a difference either way.

Despite the clinicians' concerns about underutilization of biomedical care, most of the participants with diagnosed type II diabetes maintained follow-up with the clinic. Five of the respondents went to the clinic on a monthly basis, 15 went every other month, and two went once every three months or fewer. Even the participant who relied solely on natural remedies went to the clinic on a bi-monthly basis. Only two diabetic participants never went back to the clinic after their initial diagnosis.

At these visits, individuals with diabetes had their blood glucose screened and refilled their prescriptions. However, as reported by the participants, these visits were contained to 20 min or less. In such a short consultation, participants received little personalized advice on how best to modify their lifestyle factors, such as diet or physical activity, to improve their diabetic symptoms. One woman noted,

> I just go in, get my sugar checked, and then I go out. The doctors are only there in the mornings and there are a lot of patients. So if everything looks ok, they just ask me a couple of questions about my diet or how I feel, and then write me my prescription. Then it's over, just like that. There's not really time for me to ask questions or talk about how the diabetes is going or anything like that.

Other participants echoed this frustration with the detachment and disconnect from the attending doctors.

3.2. Local understanding of type II diabetes etiology

The interview guide probed participant understanding of the etiology of type II diabetes. Among participants, there was a fairly common belief that diabetes is precipitated by a single, stressful or traumatic life event. This event was referred to as a case of *susto*, and was usually related to family crises. For example, one

respondent recalled, “My son was in a terrible car accident. When we got to the [accident scene], they had already taken him to the hospital, but we didn't know that. All that we could see was his car overturned in the ditch. We thought that he had died. This gave me *susto*, and from that [*susto*] diabetes resulted.” Another stated,

> My son was working in Cancun when a hurricane came in. We didn't have any way to reach him, and he didn't have any way to contact us. There was a lot of destruction, and since we hadn't heard from him, I was afraid that he had died. He was actually put up in a shelter in the basement of a hotel. But since I didn't know about this, I got *susto*, and a few days later I started feeling very bad. That was when I got the diagnosis of diabetes. It was that *susto* that gave it to me.

Still other accounts mentioned times of high familial stress, such as domestic abuse or extramarital affairs, as being the traumatic *susto* that resulted in the onset of diabetes. In all cases, diabetic symptoms reportedly appeared within days.

One participant also listed the hot/cold dichotomy as a contributing factor in the onset of her diabetes. In this case, it was not just one instance of hot/cold imbalance that caused her diabetes, but rather an accumulation of the negative effects of many imbalances over time. Before the onset of her diabetes, this participant would often take cold showers while she was crying. She cried frequently because she was the victim of physical abuse by her husband. She believed that crying was a “hot” action, and the showers were always cold. She explained that this sudden hot/cold contradiction could have negative effects if the body was unprepared for it. She then elaborated that the body's reaction to this hot/cold contrast was similar to its reaction to excess sugar in the blood. The respondent believed that over time, the effects mimicked the effects of elevated blood glucose, and therefore resulted in diabetes. This explanation was particularly of note, as it merged traditional and biomedical understandings of type II diabetes.

3.3. Local food practices

Most participants identified the Yucatec diet as heavy in calorically-dense foods. Participants often referred to the diet as *lleno de grasa* (fatty), and would list fatty foods, including *cochinita pibil* (a regional pork dish), *frijol con puerco* (pork and beans), and processed snack products. They noted that many dishes were cooked in animal fat. However, they mentioned that this style of eating was relatively recent, and unique to the past two or three generations. One woman elaborated,

> Now we eat meat all the time, almost every day. My grandparents, they did not eat this way. Meat was reserved for special occasions, like birthdays or family gatherings. Most of the time they just ate vegetables and beans with their tortillas. And then, everything was from the [home] garden or the *milpa*. You grew your vegetables on your land, you made your *masa* and your tortillas yourself, and you raised your own chickens or turkeys. And so everyone got more exercise, because it was the man's job to be out in the *milpa* all day, working. And the women had to work too, tending the vegetable gardens and feeding the animals and preparing the *masa* and tortillas. Now you can buy everything in the store. It's full of chemicals. It's not natural anymore. And it's not as good for you as what you make yourself. But instead you can sit around all day and watch TV and drink Coca[-Cola]. And that is what people want. But then they aren't exercising and they are eating more fatty foods. That is why everyone is getting fat.

Respondents noted the increased presence of processed snack products, such as chips, cookies, and candy. There were no grocery stores or markets in Tope, and the nearest such food outlets were 20 km away. Instead, Tope had a handful of small tiendas where processed snack products were widely advertised, much more readily available than fresh fruits and vegetables, and sold at low prices, making them attractive to low-income consumers in Tope.

Participants also mentioned tortillas as part of an unhealthy diet. Tortillas in Tope were made of *masa*, a processed corn dough high in refined carbohydrates but low in nutrients. In Tope, as in the rest of Yucatán, the diet centered on tortillas, and they were served with every meal. Respondents recognized this reliance upon tortillas, frequently stating, “Here everything is tortilla.” One woman stated:

> Before [diabetes], I would eat 30 or more tortillas each day. I would have some at breakfast, some at the main meal, and more in the evening. When I found out about my diabetes, the doctors told me that I couldn't eat that many tortillas any more. They told me that I should cut the number of tortillas that I was eating in half. That I had to go on a diet.

While many participants were aware of the health consequences associated with the heavy regional diet, they did not necessarily modify their eating habits. Out of the participants with diabetes, 12 claimed that they had changed their diets after their diabetes diagnosis, while the other 12 said that they had not. Both groups cited various reasons for their dietary choices. Most participants that had changed their diet wanted to minimize their diabetic symptoms and improve their health. Participants that had not changed their eating behaviors did not want to inconvenience themselves and their loved ones by eating differently from their families. Furthermore, they were accustomed to their diet and did not want to give up their favorite foods. While they acknowledged that changing their diets might have had health benefits, these participants placed greater importance on the role of food as an important part of their individual autonomies, personal relationships, and social interactions.

In addition to foods, participants most cited sugar-sweetened beverages (SSBs) – referred to as *refrescos [embotellados]* or simply Coca-Cola® – as the single largest contributor to the problem of diabetes. These products are omnipresent in Tope and throughout Yucatán. Many participants acknowledged that SSB consumption was a risk factor for obesity, diabetes, and other negative health outcomes. During consultations, clinicians recommended reducing or eliminating SSB consumption. Despite this knowledge, almost all participants admitted to drinking SSBs. Even the few participants who initially said that they did not consume these products acknowledged later in the interview that they drank SSBs occasionally. During the course of the investigation, the researchers noted that SSBs were available in large quantities at nearly every meal, even breakfast. Toddlers were observed receiving Coca-Cola® in their bottles. Only three of the 36 total participants abstained from SSBs completely.

Clinicians also cited lifestyle factors as a major obstacle in stemming the diabetes epidemic at both the individual and regional level. They similarly pointed to local food patterns as the biggest risk factor for diabetes in the area. Like other participants, the physicians named SSBs as the biggest contributor to the diabetes epidemic and, of note, also consumed these products themselves. When initially providing a diabetes diagnosis, the doctors recommended that people with the condition change their diets, making general suggestions such as incorporating more fresh foods and reducing unhealthy, processed ones. The clinicians stated that

although these initial recommendations were made, the majority of patients did not change the way they ate. However, respondents shared that the attending physicians did not provide specific guidelines on appropriate dietary changes to their patients. Furthermore, they noted that at later appointments, there was little follow-up on how to incorporate lifestyle changes such as diet or physical activity.

3.4. Gendered differences in healthcare utilization

Of the 125 clinically-diagnosed and recorded cases of diabetes in Tope, there were 102 reported cases in women and 23 reported cases in men. The clinic director claimed that the only men who visited the clinic were those required to receive physical examinations as part of the Prospera/Oportunidades conditional cash transfer (CCT) program. The clinic director believed that machismo was the main reason for the large discrepancy between men and women visiting the clinic. He suggested that men did not seek healthcare because they did not want to be perceived as weak or sickly, and further posited that diabetic men did not want to stop drinking, one of the major recommendations that clinicians make to patients with diabetes.

Many participants also shared the view that traditional gender normative behavior affected healthcare decisions in Tope. One participant mentioned a male diabetic she knew, saying, “The diabetes affects the way that he lives. He has pain, his vision is worse, and he feels sicker all the time. The doctor told him that he needed to stop drinking … but it is part of his life. He cannot stop.” The husband of another interviewee had also been diagnosed with diabetes. While he would occasionally take prescription medications to manage his condition, he did not follow up on clinic visits, did not change his diet, and continued to consume SSBs and alcohol. His diabetic symptoms worsened and began to affect his daily functioning. When he had to get a blood test for a job interview, “his blood glucose level was 383 [mg/dL]. And he couldn't understand why it was so high. I tried to explain to him about eating better and drinking less. But he just told me that he would not stop drinking, and that he would keep [doing things] the same as he has always done.”

Among female respondents with diabetes, there were also barriers to incorporating self-care strategies. Familial obligations often prevented these women from making the lifestyle changes recommended by both clinical and traditional healthcare providers. Many female respondents stated that they could not change their diets due to gendered norms and practices of food preparation. Women emphatically claimed it would be unacceptable for them to eat differently from their husbands or children. While these female patients knew they should follow a healthier dietary pattern, they advanced the food practices of their family and community over clinical recommendation. Other women cited the time dedicated to their housework and children as a barrier to exercise. They worried not only about time away from their families, but also what other community members would think if they exercised, since it was not a common activity for women in Tope. Although some recognized the importance of modifying their behaviors, most women with diabetes acknowledged that these familial duties and social stigmas were enough to prevent them from making meaningful changes.

3.5. The influence of international migration

A total of nine participants had close ties with the United States, either through their own migratory experience or the migration of a family member. Of these individuals, six had diabetes, and three did not. Migrant study participants placed a greater emphasis on the biomedical understanding of diabetes. They first talked about sugar, insulin levels, and the necessity of maintaining a healthy diet. All of them followed a pharmaceutical regimen prescribed by the clinic, and five had changed their diets, all in line with a biomedical approach to managing diabetes. Only one participant with a migratory experience mentioned *susto* when discussing the etiology of diabetes. In addition, only two migrants diagnosed with diabetes used natural medicine of any kind.

In Tope, households that earned remittances demonstrated greater flexibility in terms of healthcare options. For example, only participants who reported receiving remittances sought private care at specialized clinics in urban centers. These households could also afford more expensive medications and equipment, such as blood glucose monitors. Two of these participants monitored their blood glucose at home with a meter. Both of these individuals explicitly stated that buying the meter and its supplies would not be possible without remittances from the United States. Indeed, none of the participants in households that did not receive remittances used blood glucose meters. Overall, participants with a personal connection to the United States demonstrated higher levels of integration into biomedical culture and access to a wider variety of health resources.

4. Discussion

4.1. Cultural influences on type II diabetes perceptions

In Mexico and throughout Latin America, many physiological afflictions are described in terms of culturally-constructed diseases. The idea of a stressful event (*susto*) leading to physical illness is well-documented throughout the region (Chary et al., 2012; Kunow, 2003; Weller et al., 2012). In rural Guatemala, diabetic informants most often reported that the onset of diabetes resulted from a case of *susto* (Chary et al., 2012). Consistent with our findings, previous work with Mayan populations in Chiapas (Page-Pliego, 2015) found that while individuals attributed incidence of diabetes to unhealthy lifestyle habits in the long-term, it was understood that the disease was triggered by emotional stress, either long-term or sudden. Within the framework of indigenous medical understanding, emotional health is a crucial aspect of the holistic understanding of the body's relationship with the mind, society, and nature (Hale-Gallardo, 2015). An emotional stressor, be it divorce, the illness of a child, or financial strain, would therefore lead to an overall detrimental effect on health.

Furthermore, the shared communal understanding of the cause of the disease and direct contrast with biomedical professionals has been illustrated in other research on Latin America and diabetes. In Guadalajara, Mexico, both diabetic patients and community members cited *susto* as a causal factor of diabetes and recounted symptoms not included by healthcare professionals (Weller et al., 2012). Similarly, in Tope, the clinicians failed to recognize the influence that the dynamic socio-cultural context had on patient approaches to diabetes. The present culture of biomedicine is beginning to recognize that negative life events or “acute or event stress” are risk factors for a wide range of health problems (House, 2001). However, the clinicians in Tope maintained the traditional biomedical understanding of diabetes as only a physiological process and ignored the important role of emotional and environmental stressors on patient health.

4.2. Historical legacies and the patient-provider dynamic

The legacy of institutional discrimination against Yucatec Mayan communities intensified the tension between community members and healthcare providers. Historically, medical care was used as a means of social control and forced assimilation by working to

reduce the importance of indigenous medical systems in favor of biomedicine (Opperman, 2013). The unwillingness of the physicians in Tope to acknowledge the influence of local medical practices echoes these past discriminatory policies. Furthermore, mainstream biomedicine often emphasizes individual behaviors and ignores the influence of social determinants of health and other structural forces that constrain health and related behaviors (Robertson, 2015). "Structural vulnerability" describes the position of individuals in a hierarchical socio-economic order (Robertson, 2015). Within this order, health outcomes and risk behaviors are commonly viewed as individual choices and therefore often include a moral judgment by the physician (Lock and Nguyen, 2010). However, Wiedman (2010: p. 52) notes, "thus far, traditional clinical approaches have done little to address diabetes or inequalities in health. This 'blaming the victim' approach has not produced results, thus a shift to the larger social, cultural, and global factors is necessary". Our research reinforces these principles, illustrating how in Tope, there was a continued disconnect between medical doctors and indigenous communities that exacerbated the negative health outcomes of marginalized persons.

4.3. The changing food environment

Tope's transition away from a plant-based and towards a more meat-heavy diet mirrored changes in food systems of other economically developing nations as prices of meat are driven down (Speedy, 2003). Increased meat consumption has been correlated with a wide range of health problems, including type II diabetes (Micha et al., 2010). The recent changes in Tope's food environment also reflected the growth of Yucatán and the expansion of the tourist industry, which exposed residents to foreign influence, including food products (Leatherman and Goodman, 2005). Throughout the world, expansion of markets, economic development, and foreign influence have caused an increase in consumption of calorically-dense, nutrient-poor foods (Hawkes, 2006). These highly processed snack foods have repeatedly been shown to contribute to obesity and diabetes (Popkin, 2001).

The most conspicuous processed products in Tope were Coca-Cola® and other SSBs. These beverages were an integral part of the diet and daily life in Yucatán. Mexico is the largest consumer of Coca-Cola® in the world, and its citizens drink, on average, 163 L per year (Colchero et al., 2015). Other developing countries have similarly struggled with the introduction of SSBs (Malik et al., 2010; Popkin et al., 2012). Mexico, however, is an exceptional case. Between 1999 and 2006 the increase in calories from SSBs was the highest ever documented in a nationally-representative survey (Barquera et al., 2013b). Such products increase the risk of diabetes (Malik et al., 2010), and their integration into Tope and Yucatán posed a serious public health challenge.

4.4. Gender constructs and type II diabetes

Individual's health behaviors are influenced by the social context in which they live (Mahalik et al., 2007). Gender constructs, such as the machismo prevalent in Tope, exist in a larger social structure that is also determined by social class. While there is much academic debate (Gutmann, 2007) around the concept of "machismo", masculinity within Mexico has traditionally been understood as a hierarchy of dominion, control, and power and associated behaviors that project an image of strength (Vigoya, 2003). Masculinity in rural Yucatan encourages participation in high-risk health behaviors, such as excessive drinking and renouncing healthcare (Courtenay, 2000) that may worsen symptoms of type II diabetes. In low-income areas, such as rural Yucatán, machismo is reinforced (Vigoya, 2003) as the macho identity has persisted much more in small, rural communities such as Tope than it has in urban centers (Appendini, 2009). In this study, both clinicians and community members of Tope acknowledged the strong social stigma that men attached to seeking healthcare, whether from traditional or biomedical sources. A similar mentality has been consistently observed across men of many cultures (Courtenay, 2000).

Furthermore, the existence of machismo in conjunction with traditional female gender roles such as those that existed in Tope often prevent women from prioritizing their healthcare needs and from accessing health resources (Kimoto et al., 2014). As in our research, the needs and preferences of the family trump the lifestyle demands of women's healthcare regimens. The modification of these gendered behaviors would be difficult, as it would involve challenging a social construction that has been deeply ingrained in Tope and many other rural Mexican communities.

4.5. International migration, cultural shifts, and health behaviors

Over the past 20 years, migration from the southeastern states of Mexico such as Yucatan to the United States has grown rapidly (Riosmena and Massey, 2012). Immigrant acculturation to the United States has been associated with increased healthcare seeking within the biomedical context (Lara et al., 2005). For diabetes specifically, higher SES significantly reduces the risk of diabetes among older Mexican immigrant populations to the United States (Afable-Munsuz et al., 2013). In fact, those participants from Tope with migratory experiences were more inclined to seek specialized biomedical care and less resistant to changing their diet by incorporating the food suggestions given by the clinic. These particular healthcare-seeking behaviors therefore stemmed from migratory participants' increased exposure to the biomedical culture and from their greater financial resources to access these options. Consistent with our findings, households that receive remittances generally spend more on healthcare than those that do not (Airola, 2007).

4.6. Study strengths and limitations

The qualitative research approach of this study allowed a deeper understanding of diabetes and how it is experienced and understood within an indigenous community in Yucatán, Mexico. This study contributes to the understanding of the social and cultural factors that influence diabetes management in rural Mexico and how care pathways are chosen and negotiated. We are able to illuminate the subjective experiences of diabetic and non-diabetic community members, shedding light on the various structures and cultural practices that inform diabetes care. The study provides insight into how some of these factors may interplay and affect diabetic health outcomes in low-income, indigenous communities in southern Mexico.

This research was limited to one small community in Yucatán with 36 total interviews and like all qualitative findings, its generalizability is limited. Interviews were conducted in Spanish, the PI's second language, but often translated into Spanish from Maya via the key informant. Aspects of communication can be lost in translation between three languages. Despite these limitations, the study highlights the importance of cultural understanding in healthcare systems and may have applications for addressing diabetes in other settings. Our findings in the role of traumatic or emotional experiences (*susto*) as well as of herbal remedies for diabetic therapy has been noted in other research (Kunow, 2003; Weller et al., 1999), reinforcing the centrality of indigenous understandings and treatment of disease. Additionally, this research further underlines the importance of food environment and choices

in the perpetuation of diabetes (Popkin et al., 2012).

5. Conclusion

This study highlights the diabetes-related knowledge and practices among members of a rural community in Yucatán, Mexico. The combination of traditional and biomedical concepts of disease etiology and provision of care present a unique environment for conceptualizing the social significance of type II diabetes and its management strategies. The relatively recent introduction of affordable, high-calorie food and beverage products into the regional diet has further contributed to this dynamic. Although there were locally available options to manage type II diabetes, the commingling cultures and the socioeconomic environment prevented these from being fully effective.

The Mexican government has already established a tax on SSBs, aimed at stemming the diabetes epidemic. However, much more needs to be done in order to more aggressively attack diabetes in indigenous communities. An integrative, less biomedical approach to diabetes management would increase the buy-in from indigenous populations. Healthcare that is culturally relevant as well as affordable is one way to increase both access as well as utilization. One possible avenue would be the development of an outreach program centered on cultural preservation that emphasizes the benefits of a traditional diet, one much less dependent on meat and processed snacks. Given a recent resurgence in movements to preserve indigenous culture (Jackson and Warren, 2005), such an approach would be both timely and has the potential to reach a large number of individuals at risk of developing type II diabetes in rural Mexico.

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